

Esters of Glucose and Lactose

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A number of straight-chain aliphatic acid esters of glucose and lactose were prepared. The crystalline compounds are described below; the others are listed in Table I.

TABLE I
PROPERTIES OF POLYSUBSTITUTED GLUCOSE AND LACTOSE ESTERS

Ester	Acyl groups per mol. ^a	Elementary analyses, %				Free acidity, ^d %	[α] _D ²⁵ (c, 2.5) in CHCl ₃	M.p., °C. (cor.)	n _D ²⁰	Physical state and color
		Calcd. ^b	H	Found ^c	H					
A. Glucose										
Caprylate	4.7	67.7	10.2	68.2	10.2	1.1	+46.8		1.4587	Light-amber sirup
Caprate	4.8	70.5	10.8	70.9	10.8	1.1	+40.3		1.4612	Light-amber sirup
B. Lactose										
Caproate	7.2	63.2	9.0	63.2	9.0	0.85	+15.3		1.4646	Light-yellow sirup
Caprylate	6.9	66.5	9.9	66.7	10.2	1.5	+14.5		1.4650	Amber sirup
Caprate	7.0	69.3	10.5	69.6	10.7	2.0	+12.6		1.4657	Amber sirup
Laurate	6.5	70.7	10.9	70.2	11.1	Trace	+13.4	110-112		White, waxy solid
Myristate	7.2	73.0	11.4	73.3	11.4	0	+ 9.4	43.4-46.0		White, waxy solid
Palmitate	7.5	74.5	11.7	74.5	11.7	Trace	+ 9.0	55.6-58.2		White, waxy solid
Stearate	7.2	75.4	11.9	75.3	12.0	Trace	+ 7.9	62.5-64.5		White, waxy solid

^a Calculated from free hydroxyl values obtained by the method of Ogg, Porter and Willits, *Ind. Eng. Chem., Anal. Ed.*, **17**, 394 (1945). ^b Based on the number of acyl groups per mol. found. ^c Microanalyses by C. L. Ogg and Mary Jane Welsh. ^d By Mrs. R. B. Kelly.

All the esters but the lactose butyrate were prepared by slowly adding a chloroform solution of acid chloride (10% excess) to a stirred mixture of the sugar (β -lactose, or anhydrous α -glucose), pyridine (1.1 moles/mole of acid chloride), and chloroform.¹ After initially cooling with an ice-salt mixture (until one hour after the acid chloride was added) the reaction was carried out six to eight hours at room temperature for the glucose esters and four to thirteen hours at 50-70° for the lactose, depending upon the reaction rate.

α -D-Glucose Pentamyristate.—After three recrystallizations from an alcohol-chloroform mixture the ester formed long, fine needles, insoluble in 95% alcohol and acetone, soluble in Skellysolve C and very soluble in ether, chloroform and benzene; m.p. 59.0-59.8° (cor.), [α]_D²⁵ +38.3° (c 2.5, chloroform), +33.5° (c 2.5, benzene).

Anal. Calcd. for C₅₈H₁₀₆O₁₁(COC₁₃H₂₇)₅: free hydroxyl, none; C, 74.09; H, 11.62. Found: free hydroxyl, none^{2a}; free acidity, none^{2a}; C, 74.19; H, 11.63.^{2b}

Lactose Octabutyrate³ (β ?).— β -Lactose was stirred with a mixture of butyric anhydride (70% excess) and pyridine (1.9 moles/mole of butyric anhydride) for eight hours at room temperature, eight hours at 50°, and 23 hours at 90°. After separating the crystals which formed in the sirupy product and recrystallizing four times from a 3:1 alcohol-water mixture, the ester was obtained as fine needles very soluble in 95% alcohol, acetone, Skellysolve C, ether, chloroform and benzene; m.p. 77.0-77.4° (cor.), [α]_D²⁵ + 4.6° (c 2.5, chloroform), -14.2° (c 2.5, benzene).

Anal. Calcd. for C₁₂H₁₄O₁₁(COC₃H₇)₈: free hydroxyl, none; C, 58.52; H, 7.81. Found: free hydroxyl, none^{2a}; free acidity, none^{2a}; C, 58.55; H, 8.17.^{2b}

(1) Cf. G. Zemplén and E. D. Laszlo, *Ber.*, **48**, 915 (1915).

(2) (a) By Mrs. R. B. Kelly. (b) Microanalyses by C. L. Ogg and Mary Jane Welsh.

(3) An apparently unsuccessful preparation was recorded by M. Berthelot, *Ann. chim. phys.* [3] **60**, 98 (1860).

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